D5

$[R''NH]^-$, carboxamides $[R''C(O)NR'']^-$, carbanions $[R'']^-$, carbonate $[CO_3]^{-2}$, sulfate $[SO_4]^{-2}$, phosphate $[PO_4]^{-3}$, biphosphate $[HPO_4]^{-2}$, phosphorus ylides $[R''_4P]^-$, nitrate $[NO_3]^-$, borate $[B(OH)_4]^-$, cyanate $[OCN]^-$, fluoride $[F]^-$, hypochlorite $[OCl]^-$, silicate $[SiO_4]^{-4}$, stannate $[SnO_4]^{-4}$, basic metal oxides comprising Al_2O_3, CaO, and ZnO, amines R''_3N and amine oxides R''_3NO, and organometallics comprising $R''Li$, R''_2Zn, R''_2Mg, and $R''MgX'$, where R'' represents an organic substituent and multiple organic substituents need not be identical, and X' represents an inorganic substituent.

D6

32. (Once amended) The process of claim 31, wherein the co-reagent is selected from the group consisting of common Grignard reagents $R''MgX$, alkalihalides, zinc compounds comprising ZnI_2, $ZnBr_2$, $ZnCl_2$, and ZnF_2, aluminum compounds comprising Al_2H_6, $LiAlH_4$, AlI_3, $AlBr_3$, $AlCl_3$, and AlF_3, and boron compounds comprising $R''B(OH)_2$, BI_3, BBr_3, BCl_3, and BF_3, where R'' represents an organic substituent and X' represents an inorganic substituent.

D7

46. (Twice amended) A process of converting a plurality of POSS fragments into a POSS compound, comprising:

mixing an effective amount of a base with the plurality of POSS fragments in a solvent to produce a basic reaction mixture, the base reacting with the POSS fragments to produce the POSS compound,

wherein the POSS fragments have the formula $(RSiO_{1.5})_m(RXSiO_{1.0})_n$ and contain from 1 to 7 silicon atoms and no more than 3 rings, and the POSS compound is selected from the group consisting of homoleptic nanostructure compounds having the formula $[(RSiO_{1.5})_n]_{\Sigma\#}$, heteroleptic nanostructure compounds having the formula $[(RSiO_{1.5})_m(R'SiO_{1.5})_n]_{\Sigma\#}$, functionalized homoleptic nanostructure compounds having the formula $[(RSiO_{1.5})_m(RXSiO_{1.0})_n]_{\Sigma\#}$, functionalized heteroleptic nanostructure compounds having the formula $[(RSiO_{1.5})_m(R'SiO_{1.5})_n(RXSiO_{1.0})_p]_{\Sigma\#}$, and expanded POSS fragments having the formula $(RSiO_{1.5})_m(RXSiO_{1.0})_n$, where R and R' each represents an organic substituent, X represents a functionality substituent, m, n and p represent the stoichiometry of the formula, Σ indicates nanostructure, and # represents the number of silicon atoms contained within the nanostructure.

D8

53. (Once amended) The process of claim 52, wherein the base is selected from the group consisting of hydroxide $[OH]^-$, organic alkoxides $[R''O]^-$, carboxylates $[R''COO]^-$, amides $[R''NH]^-$, carboxamides $[R''C(O)NR'']^-$, carbanions $[R'']^-$, carbonate $[CO_3]^{-2}$, sulfate $[SO_4]^{-2}$, phosphate $[PO_4]^{-3}$, biphosphate $[HPO_4]^{-2}$, phosphorus ylides $[R''_4P]^-$, nitrate $[NO_3]^-$, borate $[B(OH)_4]^-$, cyanate $[OCN]^-$, fluoride $[F]^-$, hypochlorite $[OCl]^-$, silicate $[SiO_4]^{-4}$, stannate $[SnO_4]^{-4}$, basic metal oxides comprising Al_2O_3, CaO, and ZnO, amines R''_3N and amine oxides R''_3NO, and organometallics comprising $R''Li$, R''_2Zn, R''_2Mg, and $R''MgX'$, where R″ represents an organic substituent and multiple organic substituents need not be identical, and X′ represents an inorganic substituent.

D9

58. (Once amended) The process of claim 47, wherein the co-reagent is selected from the group consisting of common Grignard reagents $R''MgX$, alkalihalides, zinc compounds comprising ZnI_2, $ZnBr_2$, $ZnCl_2$, and ZnF_2, aluminum compounds comprising Al_2H_6, $LiAlH_4$, AlI_3, $AlBr_3$, $AlCl_3$, and AlF_3, and boron compounds comprising $R''B(OH)_2$, BI_3, BBr_3, BCl_3, and BF_3, where R″ represents an organic substituent and X′ represents an inorganic substituent.

D10

67. (Once amended) The process of claim 66, wherein the base is selected from the group consisting of hydroxide $[OH]^-$, organic alkoxides $[R''O]^-$, carboxylates $[R''COO]^-$, amides $[R''NH]^-$, carboxamides $[R''C(O)NR'']^-$, carbanions $[R'']^-$, carbonate $[CO_3]^{-2}$, sulfate $[SO_4]^{-2}$, phosphate $[PO_4]^{-3}$, biphosphate $[HPO_4]^{-2}$, phosphorus ylides $[R''_4P]^-$, nitrate $[NO_3]^-$, borate $[B(OH)_4]^-$, cyanate $[OCN]^-$, fluoride $[F]^-$, hypochlorite $[OCl]^-$, silicate $[SiO_4]^{-4}$, stannate $[SnO_4]^{-4}$, basic metal oxides comprising Al_2O_3, CaO, and ZnO, amines R''_3N and amine oxides R''_3NO, and organometallics comprising $R''Li$, R''_2Zn, R''_2Mg, and $R''MgX'$, where R″ represents an organic substituent and multiple organic substituents need not be identical, and X′ represents an inorganic substituent.

D11

72. (Once amended) The process of claim 71, wherein the co-reagent is selected from the group consisting of common Grignard reagents $R''MgX$, alkalihalides, zinc compounds

comprising ZnI_2, $ZnBr_2$, $ZnCl_2$, and ZnF_2, aluminum compounds comprising Al_2H_6, $LiAlH_4$, AlI_3, $AlBr_3$, $AlCl_3$, and AlF_3, and boron compounds comprising $R''B(OH)_2$, BI_3, BBr_3, BCl_3, and BF_3, where R″ represents an organic substituent and X′ represents an inorganic substituent.

D11

86. (Twice amended) A process of converting an unfunctionalized POSS nanostructure compound into a functionalized POSS nanostructure compound, comprising:

mixing an effective amount of a base with the unfunctionalized POSS nanostructure compound in a solvent to produce a basic reaction mixture, the base reacting with the unfunctionalized POSS nanostructure compound to produce the functionalized POSS nanostructure compound,

wherein the unfunctionalized POSS nanostructure compound is selected from the group consisting of homoleptic nanostructure compounds having the formula $[(RSiO_{1.5})_n]_{\Sigma\#}$ and heteroleptic nanostructure compounds having the formula $[(RSiO_{1.5})_m(R'SiO_{1.5})_n]_{\Sigma\#}$, and the functionalized POSS nanostructure compound is selected from the group consisting of functionalized homoleptic nanostructure compounds having the formula $[(RSiO_{1.5})_m(RXSiO_{1.0})_n]_{\Sigma\#}$ and functionalized heteroleptic nanostructure compounds having the formula $[(RSiO_{1.5})_m(R'SiO_{1.5})_n(RXSiO_{1.0})_p]_{\Sigma\#}$, where R and R' each represents an organic substituent, X represents a functionality substituent, m, n and p represent the stoichiometry of the formula, Σ indicates nanostructure, and # represents the number of silicon atoms contained within the nanostructure.

D12

93. (Once amended) The process of claim 92, wherein the base is selected from the group consisting of hydroxide $[OH]^-$, organic alkoxides $[R''O]^-$, carboxylates $[R''COO]^-$, amides $[R''NH]^-$, carboxamides $[R''C(O)NR'']^-$, carbanions $[R'']^-$, carbonate $[CO_3]^{-2}$, sulfate $[SO_4]^{-2}$, phosphate $[PO_4]^{-3}$, biphosphate $[HPO_4]^{-2}$, phosphorus ylides $[R''_4P]^-$, nitrate $[NO_3]^-$, borate $[B(OH)_4]^-$, cyanate $[OCN]^-$, fluoride $[F]^-$, hypochlorite $[OCl]^-$, silicate $[SiO_4]^{-4}$, stannate $[SnO_4]^{-4}$, basic metal oxides comprising Al_2O_3, CaO, and ZnO, amines R''_3N and amine oxides R''_3NO, and organometallics comprising R″Li, R''_2Zn, R''_2Mg, and R″MgX′, where R″ represents an organic substituent and multiple organic substituents need not be identical, and X′ represents an inorganic substituent.

D13

97. (Twice amended) The process of claim 86, further comprising mixing a co-reagent with the base and the unfunctionalized POSS nanostructure compound in the solvent.

D14

98. (Once amended) The process of claim 97, wherein the co-reagent is selected from the group consisting of common Grignard reagents R″MgX, alkalihalides, zinc compounds comprising ZnI_2, $ZnBr_2$, $ZnCl_2$, and ZnF_2, aluminum compounds comprising Al_2H_6, $LiAlH_4$, AlI_3, $AlBr_3$, $AlCl_3$, and AlF_3, and boron compounds comprising $R''B(OH)_2$, BI_3, BBr_3, BCl_3, and BF_3, where R″ represents an organic substituent and X′ represents an inorganic substituent.

D15

114. (Once amended) A process of converting a polymeric silsesquioxane into a POSS nanostructure compound, comprising:

mixing an effective amount of a base with the polymeric silsesquioxane in a solvent to produce a basic reaction mixture, the base reacting with the polymeric silsesquioxane to produce the POSS nanostructure compound,

wherein the polymeric silsesquioxane has the formula $[RSiO_{1.5}]_\infty$, and the POSS nanostructure compound is $[(RSiO_{1.5})_4(RXSiO_{1.0})_3]_{\Sigma 7}$, where R represents an organic substituent, X represents a functionality substituent, ∞ represents the degree of polymerization and is a number greater than or equal to 1, m, n and p represent the stoichiometry of the formula, Σ indicates nanostructure, and # represents the number of silicon atoms contained within the nanostructure.

D16

128. (Twice amended) A compound having the formula $[(XSiO_{1.5})_n]_{\Sigma\#}$, where X represents a functionality substituent, n represents the stoichiometry of the formula, Σ indicates nanostructure, and # represents the number of silicon atoms contained within the nanostructure.